December 27, 1990
NARRATIVE FOR DILLON QUADRANGLE
DILLON RESOURCE AREA MANAGEMENT PLAN/EIS

INTRODUCTION

The Dillon Quadrangle is entirely within the Dillon Resource Area (DRA), more or less centrally located therein. The town of Dillon is about 5 miles southwest of the center of the quadrangle. About a third of the total area consists of the Beaverhead River Basin, which is mostly filled with Tertiary sediments, volcanics, and Quaternary alluvium.

In the eastern quarter, the Ruby River Basin occurs between the Ruby Range, the Greenhorn Range to the east and the Tobacco Root Mountains to the northeast.

The Ruby Range occupies much of the southeast quarter of this quadrangle. Other mountain ranges that are partially within the map area are: the Greenhorn Range along the southeast side, the Tobacco Roots in the northeast corner, the Pioneers in the northwest corner. The Armstead Anticline, Red Rock Hills, and the Blacktail Mountains are in the southwest corner. The south end of McCartney Mountain is at the north edge slightly west of center.

The Dillon Quadrangle can be divided into three major tectonic features (Ruppel and Lopez, 1984). The eastern 60 percent is east of the frontal fold and thrust zone. Faulting in this area is associated more with the individual mountain ranges and depositional troughs than with the vast regional Cordilleran fold and thrust belt. The western 40 percent is nearly all within the frontal fold and thrust zone. "This is the lowest part of the thrust belt." (Ruppel and Lopez, 1984, p. 7). In Ts. 5 and 6 S., Rs. 10 and 11 W., a small portion of the Grasshopper Thrust Plate overrides the frontal fold and thrust zone.

In the eastern half of the Dillon Quadrangle the three principal uplifts, Ruby Range, Greenhorn Range, and the southwestern part of the Tobacco Root Mountains consist of Pre-Cambrian Archean rocks believed to be nonprospective for hydrocarbons. The northeast corner of the Ruby Range and northwest corner of the Greenhorn Range appear to be joined along the north edge of T. 7 S., Rs. 4 and 5 W., dividing the Ruby River Valley into two portions. North of T. 7 S. the Ruby River valley is divided into two parts, the northeast end of the Ruby Range and the southwest flank of the Tobacco Root Mountains. Less than 2,000 feet of Paleozoic rocks can be expected beneath Tertiary sediments in both of these northern portions. In the part south of T. 7 S., the Ruby Valley and its tributaries are draining a Tertiary-covered area that may encompass the north flank of the Snowcrest Trough. The west half of T. 9 S., R. 4 W., and the east half of T. 9 S., R. 5 W., may contain upper Mississippian Chester age sediments, Pennsylvanian Amsden and Quadrant rocks, and Permian Phosphoria beds, totaling over 2,000 feet (Perry, 1988), in addition to older Paleozoics. The Helis 1 Conly Ranch well, sec. 27, T. 8 S., R. 5 W., may have simply been a few miles too far northwest to encounter this potential sequence of rocks.

On the northwest flank of the Ruby Range is an area that is 1 to 3 miles wide in T. 8 S., R. 8 W., broadening to 9 miles wide in T. 4 S., Rs. 6 and 7 W., which lies immediately east of the frontal fold and thrust belt. It is about 25 miles long in a southwest-northeast orientation. Here, rocks of lower Paleozoic ages subcrop below Tertiary sediments, (Lopez and Schmidt, 1985). This sequence is complicated by faulting. The well in sec. 29, T. 5S., R. 7 W., found the Devonian Jefferson disappointingly tight but porosity was noted in the Madison and the Cambrian Flathead.

The remainder of the Beaverhead River Basin is in the frontal fold and thrust belt and can be divided into a number of areas, each of which has been influenced by significant local events. The southeast portion of the Pioneer Batholith fills the northwest corner of the Dillon Quadrangle. The south end of McCartney Mountain occurs in T. 4 S., Rs. 8 and 9 W. These intrusions are not considered prospective for oil or gas. Between them is a Tertiary-covered area that connects north-ward to the Divide Basin. Although metamorphosed on the flanks of the intrusions there should be an area several miles wide that could be prospective in Ts. 4 and 5 S., R. 8 and 9 W. A well in sec. 27, T. 5 S., R. 9 W. found Pre-Cambrian at 11,840 feet after drilling an apparently unfaulted sedimentary section from Cretaceous Colorado Group through Cambrian. A significant porosity zone was encountered in the lower Quadrant at 6,370 to 6,393 feet which tested 4,110 feet of water. A fracture zone in the Devonian Jefferson yielded 2,950 feet of water and another fracture (?) in the Cambrian Meagher tested 8,495 feet of water. There are source beds in the Permian Phosphoria and the Devonian Sappington member of the Three Forks Formation.

This well and several other wells, indicate that structural traps can be anticipated in the Beaverhead River Basin. These traps can be seismically located. Stratigraphic traps, such as the subcrop of specific source beds beneath the Tertiary sediments, will require some test holes to pinpoint optimum locations.

The western one-fourth of this quadrangle appears to have 12,000 feet, or more, of sediments above the Archean Pre-Cambrian, except on the Pioneer batholith and the intrusive near Bannack.

The southwest corner, Ts. 8 and 9 S., Rs. 9, 10, and 11 W., appears to be more complicated by imbricate thrust faults. The best hydrocarbon shows on the Dillon Quadrangle occur here. The well in sec. 9, T. 9 S., R. 9 W., drilled to 4,351 feet and reported Cambrian at 3,444 feet. A subsequent examination of the samples showed an age date of upper Mississippian Chester at 2,800 feet to total depth: Heath-Otter equivalents (Perry, 1990, personal comm.). The DST at 2,569 to 2,654, which recovered a small amount of free gas, appears to be in Pennsylvanian Amsden rocks. Another test at 2,675-2,750 recovered gas-cut mud. Seven-inch casing was set at 2,826 feet and a completion attempt in a number of Amsden zones failed to recover commercial gas. Several older, shallower wells were drilled 3 to 5 miles northeast. One reported an oil show. These wells were 100 feet, 1,800 feet, and 2,500 feet deep. It is not known what interval may have had the oil show.

That portion of the Grasshopper Thrust Plate that overrides the frontal fold and thrust belt in Ts. 5 and 6 S., Rs. 10 and 11 W., would probably increase drilling depths to Archean by 1,400 to 3,200 feet.

OCCURRENCE POTENTIAL

There is no oil or gas production on this quadrangle nor on nearby areas. Therefore, there is no "HIGH" occurrence potential on the Dillon Quadrangle.

The Beaverhead River Basin and the upper Ruby River Basin are believed to contain sediments with source and reservoir potential. Where the thickness of these sediments exceed 2,000 feet the area is classified as "MODERATE."

Those areas of Pre-Cambrian Archean rocks and Tertiary-Cretaceous intrusive rocks are considered to have "VERY LOW" potential for oil or gas.

In varying proximity of 1 to 4 miles to the "VERY LOW" areas is a zone of varying metamorphism which is rated "LOW" in potential.

DEVELOPMENT POTENTIAL

Seven tests for oil or gas have been drilled on this quadrangle in the past 15 years. These varied in depth from 3,263 feet to 12,048 feet. The previously mentioned well in sec. 9, T. 9 S., R. 9 W., was only 4,351 feet deep and had the best shows reported. This holds the promise of possible pools at very modest depths. Several more wells (3 or 4) are expected in the upcoming 15 years in this same area. One or two tests in a similar depth range are anticipated in the upper Ruby River Basin in T. 9 S., Rs. 4 and 5 W., searching for the north edge of the Snowcrest Trough. An additional two wells may be drilled almost anywhere in the Beaverhead River Basin and at depths of 6,000 feet (near Dillon or south of Twin Bridges) to 12,000 feet in the Argenta Flats-Ermont Gulch Area.

No "HIGH development potential areas occur on the Dillon Quadrangle.

A large area of "MODERATE" development potential is classified in Ts. 7, 8, and 9 S., Rs. 8, 9, and 10 W. (about 200 square miles). The only evaluation has been northeast of Jim Brown Mountain where five shallow wells (100 to 4,351 feet deep) have partially evaluated about 20 square miles. Two of these wells reported oil and gas shows. Two shallow strat tests (less than 1,000 feet deep) in T. 7 S., R. 10 W., are not believed to have any effect on testing that area.

The remainder of this quadrangle is classified as "LOW" development potential except for the Pre-Cambrian mountain ranges. A significant oil or gas show in the "LOW" rated area would require a re-evaluation.

The Pre-Cambrian mountain ranges are classified as "VERY LOW" development potential.

Of the seven wells predicted to be drilled before year 2005, at least one is expected to find hydrocarbon shows that will spark industry interest in this area.

REFERENCES

Guthrie, Gary E., McBride, Barry C., and Schmidt, Christopher J., 1989, Hydrocarbon Generation and Late Cretaceous Laramide Deformation in the Central Snowcrest Range, Southwestern Montana, in French, Don E., and Grabb, Robert F. (eds.), Geologic Resources of Montana: Montana GeologicalSociety, vol. 1, pp. 311-324.

Hildreth, Gail, Stratigraphy of the Mississippian Big Snowy Formation of the Armstead Anticline, Beaverhead County, Montana, 1981, in Montana Geological Society Southwest Montana Field Conference and Symposium, Tucker, Thomas E. (ed.), pp. 49-57.

James, Harold L., 1990, Pre-Cambrian Geology and Bedded Iron Deposits of the Southwestern Ruby Range, Montana: U.S.G.S., Professional Paper 1495.

Karasevich, L. P., Garihan, J. M., Dahl, P. S., and Okuma, A. F., Summary of Pre-Cambrian Metamorphic and Structural History, Ruby Range, Southwest Montana, 1981 in Montana Geological Society Southwest Montana Field Conference and Symposium, Tucker, Thomas E. (ed.), pp. 225-237.

Kennedy, Donald B., Geology and Economic Evaluation of the Utopia Mining District, Beaverhead County, Montana, 1981, Montana Geological Society Field Conference and Symposium, Tucker, Thomas E. (ed.), pp. 349-356.

Lageson, D. R., 1989, Reactivation of a Proterozoic Continental Margin, Bridger Range, Southwestern Montana, in French, Don E., and Grabb, Robert .F. (eds.), Geologic Resources of Montana: Montana Geological Society, vol. 1, pp. 279-298.

Lopez, David A. and Schmidt, Christopher, 1985 Seismic Profile Across the Leading Edge of the Fold and Thrust Belt of Southwest Montana: Oil and Gas Journal, October 7, pp. 71-76.

Perry, William J., Jr., 1988, A Review of the Geology and Petroleum Resource Potential of the Montana Thrust Belt: U.S.G.S. Open File Report 88-450C.

Perry, William J., Jr., Dyman, Thaddeus S., and Sando, William J., 1989, Southwestern Montana Recess of Cordilleran Thrust Belt, in French, Don E., and Grabb, Robert F., (eds.) Geologic Resources of Montana: Montana Geological Society, vol. 1, 261-270.

Ruppel, Edward T., O'Neil, J. M., and Lopez, David A., 1983, Preliminary Geologic Map of the Dillon 1o x 2o Quadrangle, Montana: U.S.G.S. OFR 83-168.

Ruppel, Edward T., and Lopez, David A., 1984, The Thrust Belt in Southwest Montana and East-Central Idaho: U.S.G.S. Professional Paper 1278.

Suttner, Lee J., Schwartz, Robert K., and James, W. Calvin, Late Mesozoic to Early Cenozoic Foreland Sedimentation in Southwest Montana, 1981, in Montana Geological Society Southwest Montana Field Conference and Symposium, Tucker, Thomas E. (ed.), pp. 93-103.

Tysdal, R. G., Lee, G. K., Hassemer, J. H., Hanna, W. F., Schmauch, S. W., and Berg, R. B., 1987, Mineral Resources of the Ruby Mountain Wilderness Study Area, Madison County, Montana: U.S.G.S. Bulletin 1724-A.

Tysdal, R. G., Lee, G. K., Hassemer, J. H., Hanna, W. F., and Benham, J. R., 1987, Mineral Resources of the Blacktail Mountain Wilderness Study Area, Beaverhead County, Montana: U.S.G.S. Bulletin 1724-B.

Petroleum Information cards and well logs.